CLAIMS

1. An exhaust gas purifier installed in an exhaust passage of an internal combustion engine of a combustion equipment, comprising:

a nitrogen oxide adsorbent temporarily adsorbing nitrogen oxide, and desorbing said adsorbed nitrogen oxide by a heating or a reducing atmosphere;

an adsorbed substance desorbing means arranged in an exhaust gas upstream side of said nitrogen oxide adsorbent and heating the exhaust gas or converting the exhaust gas to the reducing atmosphere; and

a combustion apparatus arranged in an exhaust gas downstream side of said nitrogen oxide adsorbent and constituted by a fuel supply means and an ignition means,

wherein the nitrogen oxide adsorbent, the adsorbed substance desorbing means and the combustion apparatus are provided within said exhaust passage.

2. An exhaust gas purifier as claimed in claim 1, wherein said combustion apparatus has an over-rich combustion region burning under an excess fuel condition by the fuel supplied from said fuel supply means and the exhaust gas from said nitrogen oxide adsorbent, and a lean fuel combustion region positioned in an exhaust gas downstream side of said over-rich combustion region and burning under

an excessive air condition by the exhaust gas from said over-rich combustion region and the air from the air supply means.

3. An exhaust gas purifier as claimed in claim 1 or 2, wherein said exhaust gas passage is branched into a plurality of branch exhaust gas passages, an exhaust gas inlet of each of the branch exhaust gas passages is provided with an exhaust gas isolating means capable of isolating the exhaust gas, and each of the branch passages is provided with said nitrogen oxide adsorbent, the adsorbed substance desorbing means arranged in the exhaust gas upstream side of said nitrogen oxide adsorbent, having the air supply means and heating the air supplied from said air supply means or converting the air to the reducing atmosphere, and said combustion apparatus arranged in the exhaust gas downstream side of said nitrogen oxide adsorbent.

4. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said adsorbed substance desorbing means has a heating means and a reducing agent supply means.

5. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said adsorbed substance desorbing

means is constituted by a heat generating resistance.

6. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said adsorbed substance desorbing means is constituted by an adsorbed substance desorbing fuel supply means.

7. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said adsorbed substance desorbing means has an adsorbed substance desorbing fuel supply means and an oxidizing catalyst arranged in an exhaust gas downstream side from said adsorbed substance desorbing fuel supply means.

8. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said adsorbed substance desorbing means is constituted by an adsorbed substance desorbing combustion apparatus comprising an air supply means and a fuel supply means.

9. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein a filter capable of capturing a particulate substance contained in the exhaust gas is arranged in an exhaust gas upstream side of said nitrogen oxide adsorbent.

10. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein said nitrogen oxide adsorbent is formed in a shape capable of capturing a particulate substance contained in the exhaust gas.

11. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein a sulfur oxide adsorbent temporarily adsorbing sulfur oxide is arranged in an exhaust gas upstream side of said nitrogen oxide adsorbent.

12. An exhaust gas purifier as claimed in any one of claims 2, 3 and 8, wherein each of said air supply means is connected to an outlet portion of a compressor of a supercharger of an internal combustion engine to which the exhaust gas passage is connected so as to utilize a compressed air from said compressor.

13. An exhaust gas purifier as claimed in claim 2 or 3, wherein an air supply means for supplying an air, and a catalyst having an oxidizing function are alphabetically arranged in place of the lean fuel combustion region formed in the exhaust gas downstream side of said over-rich combustion region.

14. An exhaust gas purifier as claimed in any one of claims 1 to 3, wherein an exhaust gas cooling means is arranged and a temperature sensor measuring a temperature of the exhaust gas coming out of said exhaust gas cooling means is provided, in the exhaust gas upstream side of said adsorbed substance desorbing means.

15. An exhaust gas purifier as claimed in any one of claims 1, 2, 3 and 8, wherein at least one of the adsorbed substance desorbing combustion apparatus and the combustion apparatus arranged in the downstream side of the adsorbent corresponding to said adsorbed substance desorbing means is provided with a frame holding mechanism.

16. An exhaust gas purifier as claimed in claim 1 or 2, wherein said exhaust gas passage is constituted by an exhaust passage of a compression ignition type internal combustion engine, and said adsorbed substance desorbing means has a fuel injection valve directly injecting a fuel into a cylinder of the internal combustion engine, and is structured such as to inject a secondary fuel by said fuel injection valve in an engine expansion stroke or an exhaust stroke.

17. An exhaust gas purifier as claimed in claim 1 or 2,

wherein said exhaust gas passage is constituted by an exhaust passage of a compression ignition type internal combustion engine, and said adsorbed substance desorbing means has a fuel injection valve directly injecting a fuel into a cylinder of the internal combustion engine, and is structured such as to slow a fuel injection timing by said fuel injection valve.

18. An exhaust gas purifier as claimed in claim 3, wherein a heat exchanger is arranged in a downstream side of said lean fuel combustion region, and is structured such as to use which is heated by heat exchanged for the exhaust gas from said lean fuel combustion region for the air supply means of said adsorbed substance desorbing means.

19. An exhaust gas purifier as claimed in claim 3, wherein an atmospheric air releasing portion having an opening and closing valve is provided in an exhaust gas downstream side of said lean fuel combustion region in each of said branch exhaust gas passages, each of the branch exhaust gas passages is combined with the downstream side exhaust gas passage in the exhaust gas downstream side portion from the atmospheric air releasing portion, said combined portion is provided with an outlet side switch valve selectively connecting each of the branch exhaust gas passages to the

downstream side exhaust gas passage, and the switch valve is switched in such a manner as to circulate the exhaust gas to the downstream side exhaust passage by closing the opening and closing valve in at least one of the branch exhaust gas passages, and the exhaust gas is discharged to the atmospheric air while executing the regenerating operation, by actuating the adsorbed substance desorbing means and the combustion apparatus and opening the opening and closing valve for releasing the atmospheric air in the remaining branch exhaust gas passages, at a time of the operation.

20. A method of controlling the exhaust gas purifier as claimed in claim 1 or 2, wherein a temperature detecting means is arranged in an exhaust gas upstream side of said nitrogen oxide adsorbent, an adsorbed amount detecting means for detecting an adsorbed amount by said nitrogen oxide adsorbent is arranged in the exhaust gas downstream side of said nitrogen oxide adsorbent, an adsorbed amount by the nitrogen oxide adsorbent at a time of the normal operation is detected by said adsorbed amount detecting means, the method actuates the combustion apparatus at the same time of or before or behind actuating said adsorbed amount desorbing means at a time when the adsorbed amount reaches a predetermined amount, the method controls such

that an air-fuel mixture constituted by the exhaust gas from the nitrogen oxide adsorbent and the fuel supplied from the fuel supply means of the combustion apparatus becomes excess in fuel, in the over-rich combustion region, the method controls such that an air-fuel mixture constituted by the exhaust gas from the over-rich combustion region and the air supplied from the sir supply means becomes excess in air, in the lean fuel combustion region, and the method stops the actuation of said adsorbed substance desorbing means and the combustion apparatus if a state in which all the adsorbed substance of the nitrogen oxide adsorbent is desorbed is detected by said adsorbed amount detecting means, thereby returning to the normal operation state.

21. A method of controlling the exhaust gas purifier as claimed in claim 3, a temperature detecting means is arranged in an exhaust gas upstream side of said nitrogen oxide adsorbent, an adsorbed amount detecting means for detecting an adsorbed amount by the adsorbent is arranged in the exhaust gas downstream side of said nitrogen oxide adsorbent, in each of the branch exhaust gas passages, the exhaust gas from the internal combustion engine or the combustion equipment is flowed in at least one branch exhaust passage, an adsorbed amount by the nitrogen oxide

adsorbent at a time of the normal operation is detected by said adsorbed amount detecting means, the method isolates an exhaust gas flow in said branch exhaust gas passages by an exhaust gas isolating means at a time when said adsorbing amount reaches a predetermined amount, the method actuates the combustion apparatus at the same time of or before or behind actuating said adsorbed amount desorbing means, the method controls such that an air-fuel mixture constituted by the exhaust gas from the internal combustion engine or the combustion equipment and the fuel supplied from the fuel supply means of the combustion apparatus becomes excess in fuel, in the over-rich combustion region within said branch exhaust gas passage, the method controls such that an air-fuel mixture constituted by the exhaust gas from the over-rich combustion region and the air supplied from the sir supply means of the combustion apparatus becomes excess in air, in said lean fuel combustion region, the method stops the actuation of said adsorbed substance desorbing means and the combustion apparatus if a state in which all the adsorbed substance of the nitrogen oxide adsorbent is desorbed is detected by said adsorbed amount detecting means, thereby returning to the normal operation state, and said control is executed in each of the branch exhaust gas passages in such a manner as to prevent all the branch exhaust gas passages from

simultaneously isolating the exhaust gas.

22. A method of controlling the exhaust gas purifier as claimed in claim 1, 2 or 3, wherein a temperature detecting means and a pressure detecting means are arranged in the exhaust gas upstream side of said nitrogen oxide adsorbent, an adsorbed amount detecting means for detecting an adsorbed amount by the nitrogen oxide adsorbent is arranged in the exhaust gas downstream side of said nitrogen oxide adsorbent, an exhaust gas pressure in the exhaust gas upstream side of said nitrogen oxide adsorbent at a time of the normal operation is detected by the pressure detecting means, an adsorbed amount by said nitrogen oxide adsorbent is detected by said adsorbed amount detecting means, and the method controls such as to actuate the combustion apparatus at the same time or before of behind actuating said adsorbed substance deserting means at any earlier time of a time when the exhaust gas pressure in the exhaust gas passage reaches a predetermined value and a time when the adsorbed amount reaches a predetermined amount.